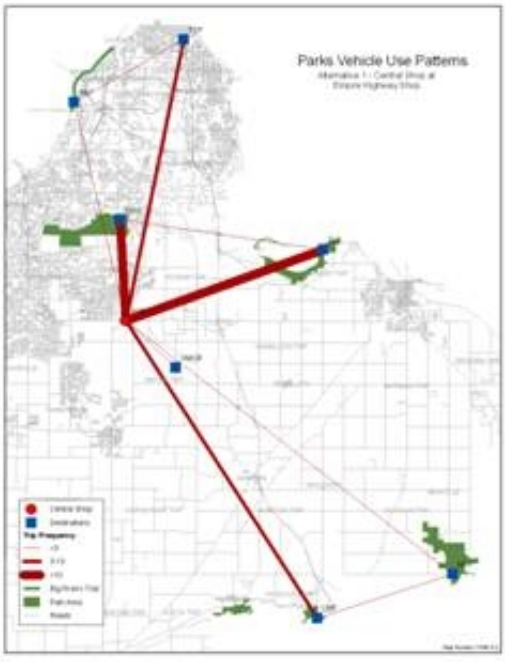
Summer 2006 Department Spotlight GIS and Fleet Management

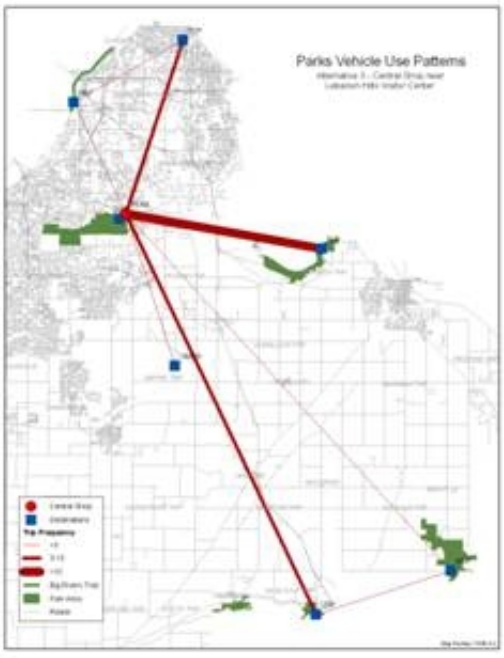
by Karen Harrington - Assistant to the Director, OMB Administration

As one of Dakota County's cross-cutting process improvement initiatives, the Fleet Management Project sought to reduce capital and operating costs and to improve service to internal and external customers. The project focused on the management of Dakota County's vehicle fleet. We needed first to determine how Dakota County currently manages the fleet; second, to analyze this method; and third, to consider the relative cost and service level of other fleet management methods.

The entire project incorporated much more than just GIS. It also included a fleet inventory, a fleet management best practices study, and a vehicle acquisition, maintenance, storage, use and disposal analysis. However, GIS was able to contribute valuable presentation and analysis to the fleet maintenance study on the question of cost changes associated with pursuing a more centralized or decentralized vehicle storage and maintenance approach.

To determine if it would be more cost effective to centralize our vehicle storage and maintenance in one location in the county or to utilize several locations, the office of GIS developed models to depict maintenance and storage scenarios. Each scenario assumed the same basic county work requirements, but had variable trip origins. For example, if a work crew needed to be at Lake Byllesby Park 5 times a week, the travel time (and therefore the cost) would be dependent on if they started from the Highway Shop or the Lebanon Hills maintenance shop.





We used ArcGIS Network Analyst to determine the amount of time required for travel from place to place in the county. Network Analyst allowed us to use a centerline dataset as a network layer. After placing origins and destinations on top of the network - for example the Highway shop as an origin and Lake Byllesby Park as a destination - the software calculated the time and distance required for travel from the Highway Shop to Lake Byllesby Park. The software also produced a shapefile of the path used, and allowed adjustments to the network to be made if the software found an unusual path.

Other factors, such as the cost of employee time spent in transit, vehicle gas mileage, and trip frequency were

factored in to get a total cost figure. We used a schematic diagram of the trips in the presentation maps, rather than the actual path via roadway the trips were calculated against. This allowed us to have a simpler and more streamlined presentation.

Similar techniques were used in the Sheriff's Department vehicle maintenance and storage pattern analysis. Using this technique we were able to provide this process improvement project with relative estimates of yearly travel costs for different maintenance and storage plans.

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Summer 2006 Desktop GIS Is Pictometry GIS?

by Joe Sapletal, GISP

Is Pictometry GIS? That is a question that we hear at Dakota County from time to time, especially from other organizations interested in the product. If you aren't already using Pictometry in your organization, the question you may be getting from your Sheriff, Assessor, parks or public works staff is, "Why don't we have this? It is GIS, isn't it?"

For those who have yet to hear of Pictometry, Pictometry International is the world leader in digital oblique aerial imagery. And, as a refresher, a GIS is used to visualize and analyze geographic features and data related to them. So, based on that definition, Pictometry is indeed a GIS.

To some of our users who perform inspections, Pictometry is an excellent way to visit a site without needlessly leaving the office. For law enforcement personnel, it is another tactical planning tool in their squad car. Most assessing staff just wants to see and query parcels and street centerlines with the imagery, but the additional layers that can be added are only limited by the amount of data that you have. Users not only have high-resolution (6-inch) orthogonal aerial photography, they also have high-resolution (6-inch) oblique aerial photography as well that they can display their own data on.

It has become more apparent over the last few years that people are visual, citizens are visual. In other words, they get more out of a photograph than a line drawing. Have you ever seen plans of your new office space or new home and thought how much easier it would be to "see" it if it was a picture, or in 3-D? Orthogonal photography is certainly helpful to some people, but oblique imagery helps others even more. The oblique imagery in Pictometry gives users a perspective that line drawings and maps lack.

There are many examples of how giving additional perspectives to people increases their understanding of what they are looking at. Architects and interior designers use three-dimensional modeling to help their clients visualize their new environment. Dakota County Parks is using Google Earth to help legislators and citizens visualize needed improvements. Dakota County Environmental Management is using 3-D fly-throughs to help people visualize the impact that the former Gopher Ordnance Works munitions plant had on the lands it occupied during World War II.

Planimetric datasets are still useful. In some cases the high volume usage of a product like Pictometry drives the creation and/or maintenance of centerline datasets and planimetric data sets. Art Kalinski, GIS Manager of the Atlanta Regional Commission, spoke recently of the initial resistance and then eventual acceptance that Pictometry encountered in his organization. He said that the increased usage of Pictometry created an increased awareness of GIS and the need for more current datasets, since their GIS data is re-projected and overlaid on the oblique imagery. Having Pictometry was a factor in pushing for creating better street centerline data and for keeping it current. This year imagery for the whole ten-county Atlanta metropolitan area is being flown.

How accurate are the images? That is the other question we hear frequently. We did some testing using existing ground control that we had from other aerial photography projects. The orthogonal photography's relative accuracy was supposed to be approximately 5 meters or less over 1000 meters, and the absolute accuracy was to be approximately 2-5 meters, all dependent on the digital elevation model used. We supplied our surface data, rather than having Pictometry use the USGS 30-meter DEM. We made use of the NSSDA testing procedures the best we could given the situation, and were pleasantly surprised with how accurate both the orthogonal and the oblique

imagery appeared to be.

But who is really using it? At Dakota County, we have 172 installs of the Pictometry Electronic Field Study (EFS) program, while many others access the imagery via the ActiveX control provided by Pictometry through our internal web mapping (ArcIMS) applications. Everyone from Transportation staff to the County Assessors are making site visits without leaving the office. The cities in Dakota County are our cost-sharing partners, and they have hundreds of installs of EFS as well. Pictometry has definitely caught on in Dakota County.

Want to see some Pictometry imagery for yourself? Then check out the Pictometry obliques found in Windows Live Local. Images of the Minnesota State Capitol can be found at http://local.live.com/default.aspx?v=2&cp=44.954941~-93.102127&style=o&lvl=1&scene=3967671.

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Summer 2006 GIS 101 Be Prepared!

by Randy Knippel

Emergencies generally have some kind of relationship to a location, and that location is associated with surrounding locations. We have access to a wealth of information and sophisticated tools to analyze it. However, GIS skills alone are not enough to make us effective in emergency situations. Emergencies are intense, with no room for error. Responders are well trained and highly disciplined to minimize mistakes and maximize effectiveness. An understanding of some foundation topics is essential for anyone providing GIS support as well.

In 2003, the Secretary of Homeland Security was directed to develop and administer a National Incident Management System (NIMS). NIMS provides a consistent nationwide template to enable all government, private-sector, and non-governmental organizations to work together during domestic incidents. The Incident Command System (ICS) was established by the NIMS as the standardized organizational structure for the management of all incidents. The concepts behind ICS were developed more than thirty years ago, in the aftermath of a devastating wildfire in California.

Both NIMS and ICS are well known in public safety and are relied upon to ensure resources are applied without hesitation in an emergency. A thorough knowledge of these topics is a foundation for more specific public safety training.

The Federal Emergency Management Agency, through its Emergency Management Institute, provides emergency response training on a variety of topics. They also have many courses available on-line through their website: http://training.fema.gov/emiweb/. Registration is required but generally available to anyone who needs it. Most classes include some form of testing and certification. Two classes in particular should be considered essential: **IS-100, Introduction to the Incident Command System, and IS-700, National Incident Management System (NIMS), An Introduction**. These classes can be found on-line at the FEMA website.

GIS support for emergency response can only be effectively applied when it is closely integrated with emergency management and response activities. The best way to do that is to become as knowledgeable as you can about the standards and procedures that govern those activities. That knowledge will help put you in a position to provide effective GIS support, rather than just being in the way.

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Summer 2006 Tech Talk Color Infrared Imagery: When There's More Than Meets the Eye

by Todd Lusk

Color infrared (CIR) imagery is not something most of us are used to seeing. It looks unnatural because the colors that features appear in are not the ones we are used to seeing in normal color photography. In fact, the colors are the exact opposite of what we expect in many cases. There is an advantage to this type of imagery, however. It reveals features we typically would not be able to see using our naked eye, because it is using a special portion of the electromagnetic spectrum: the near infrared (NIR) wavelengths.

A sample Color Infrared (CIR) image. Notice how water bodies appear almost completely black and healthy green vegetation shows up red. Only evergreen trees are showing up red in this image because it was taken in early spring before the deciduous trees had leafed out.

CIR imagery is not new technology. It has been around for many years, and existed in black and white form before color film was widely available. Today, infrared imagery is captured using not only film but also digital cameras and sensors. CIR imagery, also known as "false-color" imagery, differs from standard, or "true color", imagery in that it additionally captures the NIR wavelengths of the electromagnetic spectrum. "True color" images capture only the visible portion of the electromagnetic spectrum (i.e., the parts the our eyes can detect - what we call "light"). That ability to capture the NIR wavelengths make CIR imagery special because it allows us to use the imagery in very unique ways.

A side-by-side comparison of a Color Infrared and a "true color" image of the same area.

Traditionally, CIR imagery has been used the most in natural resources applications because of its ability to "see" the health of vegetation. The NIR wavelengths of light are reflected most abundantly by healthy green vegetation. As vegetation health decreases, the CIR film is able to detect those changes long before a human eye would be able to see them.

Different types of vegetation also reflect different amounts of NIR energy. This fact lets CIR image analysts identify the different types of vegetation in an image. For example, foresters can identify different types of trees in a stand just by using image analysis tools and CIR imagery. Oak trees reflect a different wavelength (or light signature) of the infrared spectrum than do evergreens, so they appear on the image as two different colors. The ability to detect those differences is what make CIR imagery so useful.

Natural resources is not the only place where CIR imagery is useful. Water and asphalt, in particular, absorb almost all of the NIR wavelengths of light. This allows a user to easily identify manmade surfaces such parking lots, sidewalks and driveways, because most the NIR energy is absorbed by these features and appears in the imagery as black or shades of gray. This can be useful when doing a study of impervious surfaces, because they are so easily identifiable. There are even GIS software packages available that can do the work of an analyst, automatically identifying where the impervious surfaces are in an image.

Even though CIR imagery has been around for a while, most people are probably not very familiar with it, and it may seem a bit abnormal. With the right training and tools, however, CIR imagery can be leveraged to help the naked eye see things that may not have been visible before.

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